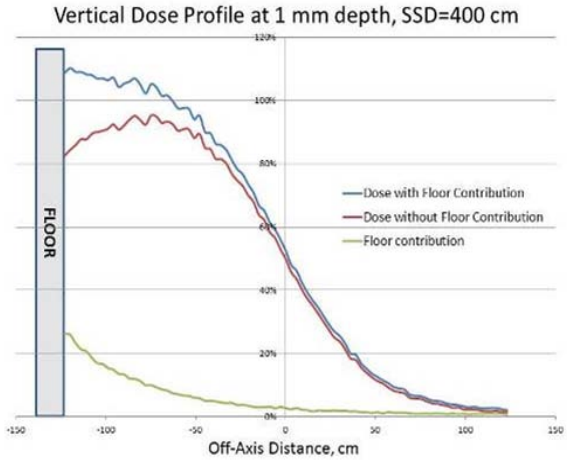
Figure 1. Vertical dose profiles



Conclusion: For the TSEI technique, dose contribution due to the electrons scattered from the treatment room floor and ceiling may be clinically significant and should be taken into account during treatment design and commissioning phases. MC calculations can be used for this task.

EP-1580

CyberKnife multi-site small beam dosimetry with a new plastic scintillator detector

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Purpose or Objective: Accurate dosimetry of small photon fields is clinically crucial, yet remains difficult to achieve. Water-equivalent detectors with small dimension compared to the beam size can be considered ideal. The aim of this work was to evaluate the suitability of a plastic scintillator detector (PSD) (Exradin W1, Standard Imaging SI) for relative small beams dosimetry over different CyberKnife systems.

Material and Methods: Five CyberKnife centers were involved in the study. Small beam dosimetry was performed with W1 PSD oriented vertically (parallel to the beam axis) within a water tank. Cerenkov Light Ratio (CLR) according to the method of Morin (Med. Phys 2013) using the two-channel SuperMax electrometer (Standard Imaging) was calculated to take into account the Cerenkov effect. Since this electrometer has not been integrated with the scanning water-tank, separate positioning and dosimetric systems were used. Output factors (OF) for cones diameters ranging from 5 to 60 mm were measured. Setup conditions were: 80 cm source to detector distance and 1.5 cm depth in water (SSD=78.5cm). Inline and crossline profiles for 5 mm circular field were also acquired at 10 cm depth in water and 80 cm source to detector distance. Same measurements were repeated by each center with the PTW60017 silicon diode. Monte Carlo correction factors reported in literature for PTW-60017 silicon diode (Francescon et al. PMB 2012, Francecon ed al. Med. Phys. 2014) were applied to detector readings for OF and dose profile evaluation.

Results: W1 PSD OF measurements averaged over all centers were lower than silicon diode MC corrected values for all field sizes, with differences within 1.7% (see table 1). Comparing OF measured by W1 PSD to MC corrected PTW-60017 diode data for each center, relative differences <2% for 60-12.5 mm fixed cones were obtained. Differences < 3.2% for 10 mm and 7.5 mm cones, and up to 4.6% for 5 mm cones in one center were detected.

Field Size (mm)	5	7.5	10	12.5	15	20	30	40	60
W1 PSD	0.665 (0.014)	0.816 (0.007)	0.870 (0.005)	0.913 (0.005)	0.939 (0.004)	0.965 (0.003)	0.982 (0.003)	0.987 (0.003)	1.000
MC corrected PTW 60017	0.675 (0.014)	0.830 (0.008)	0.880 (0.007)	0.919 (0.004)	0.943 (0.002)	0.966 (0.003)	0.982 (0.002)	0.988 (0.004)	1.000

Table 1. OF mean values and SD over the five CyberKnife centers for W1 scintillator and MC corrected diode measurements.

Dose profile measured by W1 resulted wider than MC corrected silicon diode ones for each center: (see figure 1 for 5 mm collimator of CyberKnife Unit n°1). W1 PSD profile tails were always above diode corrected values for each center.

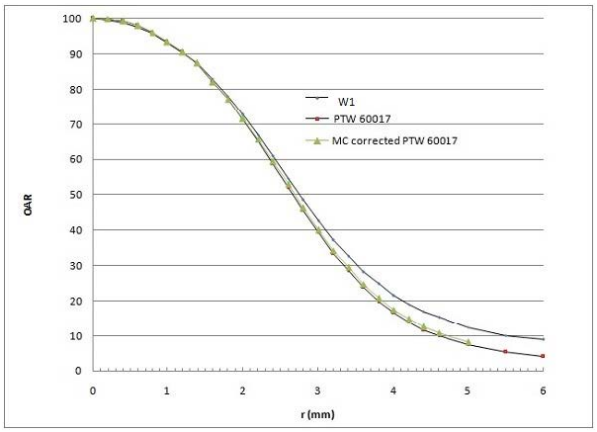

Figure 1. CyberKnife Unit n°1 mean profile measured by W1 PSD and silicon diode for 5 mm field size.

Conclusion: The agreement between Exradin W1 PSD and MC corrected silicon diode results is promising for the use of W1 PSD in small field dosimetry. However, the application of CLR correction remains a critical point in the measurement procedure and further research is needed to determine the most accurate method for CLR determination.

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PTW Starcheck 2D array for Quality Control in IOERT: an evaluation of accuracy and dose consumption

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Purpose or Objective: In this study, a PTW Starcheck device, which is an easy handle measurement equipment, is used to check the possibility of executing periodical QC in IOERT.

Material and Methods: The dosimetric properties of the new Starcheck device (T10043, PTW) have been studied for 6, 9 and 12 MeV electron beams by IOERT accelerator, the MOBETRON (IntraOp, Inc. Santa, CA.). The Starcheck, consists of 527 vented ionization chambers with small volume (0.053cc) along the principal and diagonal axes. The matrix cover an area of 26 x 26 cm with the spatial resolution of 3mm. The main beam parameters are measured at the depth of maximum dose at mentioned energies and different flat base collimator sizes (4, 5, 6, 7 and 10cm) in comparison with measures conducted with ionization chamber (Advanced Markus, PTW TW34045) and electron diode (PTW TW60012) in water phantom (PTW MP3-S) and also with EBT3 gafchromic film (International Speciality Products, Wayne NJ) in water